Council the best scientific opinion of the time through the channel of the Royal Society, which is likely to be all the more effective because it is not a formal nomination to be made by a busy Royal Society Council among other business, and it gives direct access by the President to the responsible Ministers. A further important provision is that the charter itself may receive amendment or addition, if majority votes of the Council under stated conditions be obtained and the change be allowed by the Committee of Privy Council.

We have continually urged in these columns that scientific men themselves should decide upon the allocation of funds for research, as is done by the Royal Society, the British Association, and other bodies; and that they should be responsible for any schemes of organised investigation. Friction and misunderstanding always arise when these functions are performed by official administrators unfamiliar with such a sensitive plant as scientific genius and unable to judge the promise of incipient inquiry. The remedy for such difficulties is always to ensure that the men who do the work are the masters of the administrative machine and have confidence in the direction of it by specially qualified colleagues—to promote, in fact, the same spirit of common interest between director and worker that is desired between capital and labour. The Medical Research Council seems to fulfil these conditions in every respect, and its incorporation marks a noteworthy stage in scientific development. The Council can determine its own policy, has complete control of its funds, is in direct touch with progressive science by association with the Royal Society, and, above all, its Secretary, Sir Walter Fletcher, has the full confidence of medical research workers. He knows well enough the truth of the adage *Poeta nascitur, non fit* as applied to scientific genius, and may therefore be trusted to secure the most favourable conditions for the development of this rare fruit when it appears.

During its existence the Medical Research Committee brought together a brotherhood of research workers whose scientific investigations have been of the highest national value, and it did this without limiting the freedom of action which is their heritage. We confidently look to the new Council to encourage the independent investigator as well as to create a reserve of research workers, and thus consolidate the organisation of scientific effort in the service of medicine so well begun by the Committee which it supersedes.

A Study in Palæogeography.

The Environment of Vertebrate Life in the Late Paleozoic in North America: A Paleogeographic Study. By Prof. E. C. Case. (Publication No. 283.) Pp. vi+273. (Washington: Carnegie Institution of Washington, 1919.) Price 3 dollars.

THE following passage from Suess's "Face of the Earth" might be taken as an appropriate text for the work under consideration:—"It is the organic remains, no doubt, which afford us our first and most important aid in the elucidation of the past. But the goal of investigation must still remain the recognition of those great physical changes in comparison with which the changes in the organic world only appear as phenomena of the second order, as simple consequences." Prof. Case's volume may be described as an attempt both to provide an up-to-date corpus of material, often presented in the form of lengthy quotations from the writings of American geologists, bearing upon the history of the later Palæozoic period, and to utilise the data as evidence in an inquiry into the physical and climatic conditions under which organisms lived, migrated, or became extinct in different regions of the North American continent.

The author has essayed a difficult but attractive task, and though his own conclusions and generalisations are to some extent overwhelmed by the superabundance of citations from published sources, he has succeeded in making a valuable contribution to a neglected branch of geological history. He takes a broad view of the conception of environment; it represents "the sum of all the contacts which any organism or group of organisms establishes with the forces and matter of its surroundings, either organic or inorganic" The difficulty is that we have comparatively little knowledge of the nature of the interaction of existing organisms and their environment; but it is none the less praiseworthy to extend ecological inquiry to a remote era in the hope that in this line of research, as in others, a knowledge of the past may help us to solve the problems of the present.

In the first chapter Prof. Case discusses the different categories of facts which it is essential to consider in connection with palæogeographical questions, the nature of the sedimentary deposits, the source of the sediments, the history of the flora and fauna—whether they were evolved where they were preserved, or had migrated from another locality—the influence of environment reflected in the morphological characters of animals and plants, and other factors. He empha-

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sises the importance of close co-operation between palæontologists and geologists in all matters relating to past geographies, and deprecates the over-readiness of the former class of workers to assume the existence of land-barriers. In illustration he refers to the continent of Gondwanaland, the existence of which "depends more definitely upon biological evidence and awaits full confirmation." Gondwanaland is, however, by no means the creation of palæontologists alone; its foundations are also geological. Succeeding chapters are devoted to the description of different provinces of North America in the latter part of the Palæozoic era, and the author summarises the results of an intensive study of Upper Pennsylvanian and Permo-Carboniferous rocks in certain areas. It is difficult for a reader not conversant with American stratigraphy to interpret the formations mentioned in terms of European classification, and one feels the lack of more helpful correlation-tables than those provided.

One of the most valuable features of the book is the emphasis laid on the necessity for regarding fossils as once living things, and for considering their distribution in the strata in relation to the problems presented to them by their environment. The chapter on the climatology of the later Palæozoic is a particularly useful mine of information. In the concluding chapter the author discusses the development and fate of vertebrate life in the Permo-Carboniferous period in relation to physical conditions. During Early Pennsylvanian time the conditions were singularly uniform over large areas, and the climate was equable and humid; a monotonous environment implies a limit to the number of genera and species in a flora or fauna; older and simpler types would persist because the variants, which were possibly being constantly produced, would not have a chance to develop. This idea is elaborated, though not so clearly as one could wish. It is suggested that the Upper Pennsylvanian fauna, though hampered in its further progress by the monotony of the environment, was accumulating force preparatory to a great radiation which would find expression when the limitations were removed. Prof. Case adds: "The fauna, long restrained from any expression of its evolutionary tendencies, full fed, and in the vigour of its youth, responded at once to the change, and new forms appeared so suddenly as to be unheralded in the preserved remains." This and similar passages illustrate the more imaginative side of the author's work.

The palæobotanical data are largely taken from the contributions of Mr. David White, whose researches are well known. The American Coal Measures have unfortunately yielded scarcely any petrified material comparable with that from England and a few other European countries, and although there is a wealth of plant impressions, anatomical criteria of climatic conditions are not available.

A. C. Seward.

Wheat and Wheat-growing.

Essays on Wheat. By Prof. A. H. R. Buller. Pp. xv+339. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) Price 2.50 dollars.

PROF. BULLER'S "Essays on Wheat" are among the most interesting things we have seen for a long time. As professor of botany in the University of Manitoba, he has unrivalled opportunities of studying the ramifications of the wheat industry, for in no city in the world is wheat so important as in Winnipeg. He is singularly fortunate in his subject, and he tells his story remarkably well, giving the wealth of detail, the figures, and the references needed by the man of science, without sacrificing interest or literary form.

The first essay deals with the early history of wheat growing in Manitoba. It is a story in which Parkman would have revelled. The first attempt was made in 1812 by a little band of pioneers sent out from Scotland by Lord Selkirk to colonise the 116,000 sq. miles of territory granted to him by the Hudson Bay Co.; they settled at the junction of the Red and Assiniboine rivers where Winnipeg now stands. The first crop failed, as also did the second. The failure is scarcely surprising. "There was not a plow in the whole colony, the one harrow was incomplete and could not be used, and all the labour of breaking up and working over the tough sod had to be done with the hoe." The Indians were amazed, and nicknamed the colonists "jardiniers." Fortunately for the settlers, potatoes and turnips did well, or they must have had two very bitter winters. The third crop succeeded. But the troubles were by no means at an end. Birds were a great nuisance, especially the now extinct passenger pigeon. In the fourth year the adherents of the North-West Company and their half-breeds made serious trouble and caused no little bloodshed, and, to crown all, in the sixth year, just as the settlers were about to reap their second good harvest, there came a great plague of locusts which stripped the fields and gardens bare. It was more than even these brave men could stand; the old record says: "The unfortunate emigrants, looking up to heaven, wept." It speaks volumes for their good Scottish upbringing if they did no

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